



KAYE GREEN

GADOLINIUM

Element Symbol: **Gd**

Atomic Number: **64**

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Spectroscopic lines due to gadolinium were first observed in 1880 by Swiss chemist Jean Charles Galissard de Marignac in samples of several rare earth oxide minerals. Then in 1886, French chemist Paul Émile Lecoq de Boisbaudran separated gadolinia, a rare earth oxide, from yttria. Elemental gadolinium was isolated only recently, and like the mineral gadolinite, is named after Finnish chemist and geologist Johan Gadolin.

Elemental gadolinium is a reactive silvery-white metal, which exists in nature in the oxide minerals monazite and bastnäsite, together with other rare earth metals. Ironically, only trace amounts of gadolinium are present in the mineral gadolinite. Historically, Australia has exported significant quantities of monazite from heavy mineral sands mined in Western Australia, New South Wales and Queensland for the extraction of rare earth metals including gadolinium. However, China is both the largest supplier and user of these metals.

Gadolinium has the highest thermal neutron capture cross-section of any known element and in its common trivalent oxidation state it has a single electron in each of its seven *4f* valence orbitals, which gives it the equal largest number of unpaired electrons of any element. These chemical properties give rise to important medical and industrial applications for gadolinium compounds, including use as intravenous contrast agents to enhance images in medical magnetic resonance imaging and use in targeting tumours in neutron capture therapy. Gadolinium compounds are also employed for neutron shielding in nuclear reactors and for making green phosphors for colour TV tubes and compact discs.

Provided by the element sponsor Collete Boskovic

ARTISTS DESCRIPTION

Reading about Gadolinium took me into the depths of incomprehensible scientific language.

“Gadolinium has the highest thermal neutron capture cross-section among any stable nuclides: 259,000 barns. It is strongly paramagnetic and demonstrates a magnetocaloric effect. The effect is considerably stronger for the gadolinium alloy $\text{Gd}_5(\text{Si}_2\text{Ge}_2)$. Individual gadolinium atoms have been isolated by encapsulating them into fullerene molecules and visualized with transmission electron microscope. Individual Gd atoms and small Gd clusters have also been incorporated into carbon nano tubes.”

See!

I decided to concentrate on creating a print to describe the fact that it is a silvery-white malleable and ductile rare earth metal.

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